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Man is enabled to explore his immediate spaces due to the combined functioning of sensory perception and neuro-muscular co-ordination. Relying upon learned redundancies in the world about him and being aware of his own physical capabilities, he is able to avoid chaos as he utilizes his space. The senses of vision, audition, and touch successfully co-operate to allow man an orderly manner of movement and to awaken him to the world outside himself.

Over the millenia man has established territories to assure himself and his family a place to rest, mate, and rear offspring. Man has erected extensions, or invisible bubbles, of varying dimensions about himself in his dealings with his own as well as with other species. Man is not solely dependent on instinctive processes as are lower orders of animal life; instead he may think abstractly. Due to this capability, man has been able to convert many of his extensions to physically enclosed spaces which he is able to control and organize about his life.

The importance to space design of the twentieth century concept of relativity cannot be over-valued nor can it be justly ignored. Present and future designs should utilize the space-continuum to the fullest degree whenever possible to furnish man with expanding scenes that juxtapose themselves one to another with man's constant perceptual shifts.

Architecture's primary concern is spatial enclosure, but simply to erect a weatherproof, functional cube is not considered spatial design. Careful consideration must be given to the kind of enclosure that is created so that it enhances the activities for which it provides. Esthetics cannot be ignored, nor can the psychological factors that vary with every human being.

PERCEPTION, EXTENSION, AND ENCLOSURE OF SPACE

by

Ralph James Green

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INTRODUCTION

Space is as relative to the human organism's basic welfare as gravity, oxygen, nourishment, water, and a few other well-chosen necessities. The problem of proper spatial distribution, having become as vital as those of air pollution or contaminated lakes and rivers, increases daily with the multiplication of the population.

Today there is a rather frightening rumor that by the year 2000 there may be twice as many citizens in the United States as there will be in 1970. Unfortunately, there has been no implication that the land mass of North America may expect a like increase in such a short span. Barring a disastrous catastrophe on the one hand and discounting a major miracle on the other, solutions must be reached that will create a better world for tomorrow and leave this era the last to yearn for any good old days.

Where space does not exist today, it must be created for tomorrow. Unlike some other physiological requisites, space may be attained through highly developed techniques of construction that do not depend on recreating but merely on enclosing what already exists. Evolving from the designs of Gropius, Le Corbusier, and Mies Van Der Rohe, high-rise apartments and sky-scraping office buildings enable a large concentration of people to live and work over an area of

land that could tolerate only a minimal percentage of the same concentration in three- or four-story apartment buildings and even less as individual family lots. Not only would the same portions of land accommodate a higher tolerance of residents, but their initial square footage may be doubled to include public facilities when the ground floor as well as the flat roof of a modern skyscraper are serviceable. Where land simply does not exist, Buckminster Fuller has conceived designs for entire cities that could float on water.

Considering the total square mileage of America in reference to its total population, a vast majority of the land accommodates no more than an average rural concentration. Some land, like Death Valley, California, or the Great Dismal Swamp, is still uninhabitable, and even more land is part of a national parks system which belongs to everyone and must remain so. Land devoted to farming and ranching, barely feeding this country now, should proportionately increase with--not be decreased by--the birth rate.

What must be logically considered then is a more rational distribution of urban and suburban concentrations where they already exist or where soil is poor and natural scenery is unknown. Making our farm land and national parks available to future land developers is as distressing an idea as stabling the Hell's Angels in the Metropolitan Museum. Since very little land remains for urbanization--

decreasing in proportion with every birth, every minute of every day--the space race for proper density between Americans and America must be considered as urgent as the race for the moon between the United States and Russia.

In a decade that has witnessed the encircling of the world in eighty minutes and the projection of missiles to the stratosphere, an inventory of reputedly modern housing's ills is as depressing as a list of war fatalities. Both are unnecessary; in fact they are as incongruous as a postilion guiding a post chaise. Jules Verne's fantasies have become facts, but, his contemporary, Leo Tolstoy's humanism has scarcely progressed from ideology.

Tolstoy wrote of man in his glory and in his despair, in love, in death, in life, in all the actions and reactions that befall everyone on his way to eternity. He was concerned with the myriad whims of life and man as he encountered them. Tolstoy devoutly felt that by simple virtue of surviving each inconstancy, man, for all his weaknesses, faults, or evils, had the right to the basic modicum of accommodations life could offer: air to breath, water to drink, food to eat, and space in which to move.

With little enough effort, it may be assumed that man is the chief cause of his own misfortunes, social as well as personal, and as such he must alleviate the situation himself. Drama abandoned the deus ex machina as a means of solution over a thousand years ago, yet today many of our

most critical problems are dealt with a wave of the hand either to God or the government. In either case, if man helped himself he would find his solutions much sooner.

As a conversational topic, interior space is a little like Freemasonry: everyone knows that it exists, but few, if any, know what it is all about. Proper spacing may be the least comprehensive of all the necessities. High school science courses are generally informative regarding food, air, and water, where they come from and why they are necessary to the human organism. The subject of proper spacing, on the other hand, is broached as often as the subject of organized religion.

The purpose of this thesis is to instill a broader interest in man's perception of his spatial extensions. The findings and writings of authorities on the subject of space have been explored and are presented simply to encourage further study of specific problems and solutions of space design. Hopefully, some questions will be answered, but even if questions arise, heretofore unasked, this thesis will serve a definite purpose.

CHAPTER I

SPATIAL PERCEPTION

> Man is first, last and always like other members of the animal kingdom, a prisoner of his biological organism.
>
> --Howard and Templeton, 1966

Chunk a stone into a quiet pond and an interesting pattern of concentric circles radiates across the water's surface. Several stones, successively chunked, design a much more fascinating pattern of circles, interacting in various ways, each upon the other. Just as the stones in the water, each human organism creates spaces that encircle him and interrelate with the diverse spaces established by other organisms. The primary subject of this thesis is the encircling spaces, and by first observing the organism that sets them in motion their importance becomes more meaningful.

Undeniably, the average human organism consists of one torso which houses the respiratory, circulatory, digestive, excretory, and reproductive organs and comes equipped with an even distribution of two arms and hands with ten fingers, two legs and feet with ten toes. These two sets of appendages furnish man, our center of reference, with his mobility through oriented space; however, man's mobility would be worth very little without the information gathered by his variety of sensory systems. The sense of touch in

the finger tips provides the perception of near space while remote space is perceived through audition and vision.

Dead center between each shoulder is the head--the organism's mobile control system--which usually sports a brain and two sets of distance receptors, the eyes and ears. Ittleson says, "It is these highly developed receptors which liberate the organism from complete dependence on the state of things adjacent" to the body, thus enabling the higher animals to contend with their environment (Ittleson, 1960: 10). It may often be observed that in reaching for an object, the head tends to point in the object's direction and even as early as three weeks after birth the infant will turn his head to light before his eyes are open (Carr, 1935: 10).

Redundancies

Man's awareness of directions in space may be due to this distribution of the sensory organs to the body's extremities (May, et al, 1958: 110). The point of departure in analysing man's behavior in his spaces, is this physical nature of the body and the physical and physiological constraints that influence and limit his movements, the most fundamental of which are provided by the mechanical structure of the neuromuscular system. "Each joint has a limited direction and range of movement . . . controlled by contraction in particular muscles (Howard and Templeton,

1966: 9-11)." Two mutually reinforcing sets of nerves, the proprioceptors and the exterioceptors, run throughout the body. As man works his muscles, the proprioceptors keep him informed of kinesthetic space perception, that is, the extent to which the muscles and nerves normally allow. The exterioceptors, located in the skin, relay heat, cold, touch, and pain, thus indicating a qualitative difference between kinesthetic space and thermal space, neither of which are always visually, auditorily or even tactually perceptible (Hall, 1966: 52).

The sensory consequences of the body's movement in relation to external stimuli construct spatially co-ordinated behavioral patterns known as redundancies. Such predictable features of body's structure and environment's construction expedite an accurate achievement of spatial objectives and restrain chaos (Howard and Templeton, 1966: 7, 11). Man is so completely dependent on this repertory of responses and simultaneous sensory perception through each system which reinforces the others, that all physical actions would be difficult if not virtually impossible should a break-down occur (Hall, 1966: 96). Spatial behavior then is conditioned by (1) the internal capabilities of the body, that is, by the way in which the human body is constructed and normally develops, and by (2) the nature of the physical world, that is, by environmental or ecological constraints (Howard and Templeton, 1966: 7).

Sensory Co-operation

However, spatial behavior thus stated could be equally indicative of an amoeba. It is man's highly developed co-operative sensory systems which set him at the apex of evolution and provide his spatial behavior with the most advanced impetus. It is the successful co-operation of the various senses that gives man his specific knowledge of the location, size, shape, stability, and mobility of objects in his environment and allows him to move about in an orderly manner (Carr, 1935: 7).

Extensive research has been carried out by experimental psychologists in the area of the spatial subtypes--kinesthetic, tactile, visual, and auditory spaces--each of which are reported separately by each of the senses (May, et al, 1958: 110). In addition, recent perceptual studies conclude that perception is an "essentially creative process actively carried on by the organisms." These studies assume that the individual acts according to the result of his perception of his spatial orientation (Ittleson, 1960: 7).

Through total sensory perception, man is awakened to the world outside himself. Furthermore, this contact through his senses, going far beyond cerebral activity, is usually conceived as being the only medium man has at his disposal to engage the full awareness of space, "requiring involvement of the whole self to make a full response to it possible (Bacon, 1967: 15)."

> Perceiving is that part of the process of living by which each one of us from his own particular point of view creates for himself the world in which he has his life's experiences and through which he strives to gain his satisfaction (Ittleson, 1960: 19).

While perceptions are considered unique to each individual, there are undoubtedly areas of communality. Just as the sensory systems co-operate, and redundancies set a limit to chaos within the organism, so must a certain amount of perceptual agreement between organisms exist in any society (Ittleson, 1960: 16).

It is possible that Le Corbusier was speaking of esthetics rather than physiology when he said, "by forms and shapes" the architect "affects our senses to an acute degree and provokes plastic emotions (1928: 1)." The statement is equally valid whether applied to organic perception or esthetic judgment.

Visual Perception

It may be correct to assume that vision was the last of the senses to evolve and, as such, has become the most complex, reinforcing the other senses. The amount of data perceived by the visual system is not only much greater than that perceived by the auditory, olfactory or tactile systems, but the data are fed to the nervous system at a much greater speed (Hall, 1966: 61).

Few people are consciously aware of the fact that vision is an active rather than passive process. Talking

and understanding are more easily realized as being synthetic processes than are vision and audition.

Only the sensation of taste is consciously subjective; the taste is perceived in the mouth, not in the object tasted. In smell, the sensation is perceived in the nose but assigned to an object. However, the sensation of hearing is objective; normal sound is referred so completely to a distant object that there is little conscious sensation within the ear. In sight, as well, the impression is so unconsciously projected back into space that it is extremely difficult to realize that sight is essentially as subjective as taste (Luckiesh, 1965: 30).

Howard stated that the human visual system has three main tasks: (1) to provide information that localizes a seen object and ascertains its stability; (2) to maintain the accurate functioning of those informing mechanisms in spite of the observer's changes of position of his eyes, head, or body; and (3) to provide a measure of judged distances and relative directions identical to the perceived space (1966: 14).

The Eye

The eye's retina--the screen on which the world is projected--is composed of the fovea, the macula, and the peripheral reception region, each functioning separately, yet each simultaneously blending into the other and enabling

man to see in three different ways. Under normal optical conditions the fovea, which is evolution's latest development in man, as well as in birds and anthropoid apes, permits the eye to focus on a small area from one-ninety-sixth of an inch to one-fourth of an inch at distances less than a foot from the eye. The macula, a yellow oval of tissue, surrounds the fovea and enables man to engage in the average close-work of reading, writing, sewing, and other actions within arm's length. Movement is detected from the corner of the eye and is seen peripherally (Hall, 1966: 66).

Edward T. Hall in The Hidden Dimension described a familiar scene to illustrate the types of information received from the different areas of the retina of a man with normal vision seated in a restaurant. At a distance of fifteen feet he can tell if a table is occupied and by how many people, providing they are separately visible against the background. At a forty-five degree angle the color of a woman's hair and dress are perceptible to him, but the dress's material is not. The man can tell if the woman is talking in her escort's direction and ascertain the escort's more evident motions, but he cannot see a ring or even a wrist watch. He can tell the general age, sex, and body build of a person, but he cannot tell if the person is an acquaintance (1966: 67).

Spatial design might consider the structure of the eye in a number of ways. At the periphery, movement is

exceedingly noticeable, particularly straight vertical lines and black and white stripes. Tree-lined roads in France are known to have the effect of slowing down the motorist; whereas, visual impacts are eliminated in tunnels to aid in the maintenance of the proper speed. In public places like restaurants, libraries, and museums a sense of crowding can be altered by the reduction of movement in the peripheral field; conversely, an increase in movement can bring large areas into closer relation (Hall, 1966: 68).

The Visual Field

In discussing vision it may be helpful to distinguish between the retinal image and the exterior environment which is perceived to create the retinal image. James Gibson, the Cornell psychologist, labeled the former the visual field. This is simply a picture with definite boundaries within which are merely contours of colored surfaces. In this instance the eye is no more than a camera, and the retinal image no more than a photograph. The visual world is the boundless exterior--every part of which is fixed relative to every other part--which is not only perceived but reconstructed in a unique, personal way (Gibson, 1950: 26-27). It may be said then that man acts within and reacts to his visual world as a result of his perception and interpretation of his visual field.

It would be even more helpful if all authors followed

Gibson's example, and differentiated between the two terms. Harvey Carr, writing before Gibson in 1935, used either term at the toss of a coin to refer to either conception. At any rate, he referred to what Gibson termed the visual field as a "sense continuum . . . spatially subdivided into positional elements which are sensibly continuous with each other, thus exhibiting a spatial pattern (1935: 155)."

Under ordinary conditions of vision the body is partly visible, constituting a major portion of the extreme boundary of the visual continuum. The brows, cheeks, and nose constitute the upper and lateral limits of the visual field, while the front of the torso locates the field's lower middle portion. However, there are instances in visual space perception in which the body is not visible such as microscopic and telescopic observations (Carr, 1935: 270).

Viewing a broad landscape, the observer will see himself in contact with the earth and relate the amount of land between him and a distant object to that between the object and the skyline. By varying the distance according to past and reasonably accurate judgments of distance, with himself and the skyline as two points of reference, the observer may regard the intervening distance as a practical constant. Thus his distance from the object is estimated on the basis of its location between the two points of reference (Carr, 1935: 270). The position of the object may be materially

altered by the observer's lying on the ground, in which case the apparent distance becomes much greater. The opposite effect is gained when the view is seen from a height of fifty feet (Carr, 1935: 271).

Everyone is well aware of the fact that under normal conditions the air is not totally colorless but usually has some varying degree of blue coloration mixed from dust, smoke, and moisture. Within given conditions, the density of the atmosphere can easily affect the judgment of distance. In the clean, clear air of the Rocky Mountains, high peaks will appear to be within walking distance and actually be somewhere in the adjoining county. The heavy sea air will create a reverse effect, causing a ship in the distance to appear much farther than it actually is. We may assume that as the atmosphere's density increases, so does the perceived distance. Since an object at a far distance may be perceived as being proportionately smaller than when perceived near at hand, it may also be stated that perceptual size remains a constant for relatively near distances, but decreases as the distance increases (Carr, 1935: 269).

Hall believed that men and women, as well as different ethnic groups, inhabit different visual worlds (1966: 65). Whether or not he was right remains debatable, but there are old jokes about women drivers who do not see garage doors, parked cars, stop signs, ad infinitum. Men supposedly do not see a wife's new dress, matching sox,

fallen leaves or dirty clothes hampers. At any rate, the visual world as has been defined would appear to be a psychological reconstruction dependent on a great variety of factors. The visual field in turn may be a purely physiological action depending only on the normal functioning of eyesight.

Perspective

The conventional opinion is that the advantage of the stereoscopic effect is due solely to man's capacity for binocular vision. Observers indicate that one-eyed people can see in depth very well, their greatest liability being impaired peripheral vision on their blind sides. Not only that, but the stereoscopic factor only functions accurately within sixteen feet from the observer beyond which objects begin to flatten out (Hall, 1966: 68).

Gibson, the psychologist, investigated man's various systems of depth perception and identified thirteen varieties of perspective sensory shifts. The shifts are easily likened to the most familiar vowel and consonant combinations used to form words, thus indicating that a total perceptual scene is composed from several of these different elements, each portraying depth in its own particular way. Gibson listed them as follows:

1. Texture Perspective.--As a pattern recedes in the visual field, its density gradually increases.

2. Size Perspective.--As similar shapes recede in the visual field, each becomes increasingly smaller than its predecessor.

3. Linear Perspective.--Parallel lines recede to a distant point in the visual field.

4. Binocular Perspective.--The slightly different image in each eye's visual field creates the stereoscopic effect when properly focused.

5. Motion Perspective.--A gradual change in shapes' relations to each other in the visual field is caused by the movement of the observer.

6. Aerial Perspective.--The coloration of air indicates distance due to the previous accurate judgments and present conditions of illumination.

7. The Perspective of Blur.--A decrease toward the center of clear vision may be illustrated by focusing on a near object so that the background is blurred.

8. Relative Upward Location in the Visual Field.--More pertinent to outdoor distances, the effective stimulus gradients are usually produced by the ground. The observer in normal conditions of vision will locate the horizon near the top of his visual field and look down on near objects and out to distant ones.

9. Shift of Texture's Density or Linear Spacing.--A sudden change in density of the same texture or in the spaces between the same parallel lines indicates a greater

distance than the gradual reduction defined in the first three perspective shifts.

10. Shift in the Amount of Double Imagery.--By focusing on a distant point, intervening objects are seen as double, the nearer objects being the most noticeably doubled and the gradient acting as a cue to distance.

11. Shift of the Rate of Motion.--The observer will distinguish near objects from far by seeing that as he moves the nearby objects move more quickly in displacing themselves.

12. Completeness or Continuity of Outline.--Assuming that all objects have regular outlines, the complete or continuous aspects are seen to be nearest the viewer.

13. Transitions between Light and Shade.--Not to be confused with black and white, an abrupt shift on the visual field in brightness--as in density of texture--will indicate a sharp edge. Gradual decrease in brightness, however, will indicate a modeled contour (Gibson, 1950: 138-144).

Auditory Perception

Localization is the first problem in auditory space perception, and generally both eye and ear co-operate in determining the sounding object. The object by itself has no auditory locality and, in a similar manner to the visual perception of distance, a standard of reference must be ascertained to perceive the auditory space (Carr, 1935: 92).

The distance between the observer and the sounding object is neither heard nor seen, but rather the sound from the object is heard and the spatial relation between observer and object is interpreted on the basis of the object's visibility. Previous visual and tactual experiences are absolutely necessary to establish the size and shape of an object as well, although the nature of its sound is identified by the cochlear mechanism. At a concert, the orchestra's horns, drums, cymbals, and violins are easily distinguishable in sound, but it is only previous knowledge that enables us to localize each sound and correlate it to the proper instrument (Carr, 1935: 155).

Pitch may possibly be utilized to judge the distance of the human voice. In order that our voices might carry beyond the normal conversational distance, we speak more loudly than in usual conversation. Such effort of this sort results in raising the voice's pitch, modifying its tonal complexity, and prolonging each syllable (Carr, 1935: 103).

Although auditory perception of space differs from visual perception in several ways, both are concerned in locating objects in reference to each other as well as to the observer. By comparing the size of nerves connecting the eyes and the ears to the center of the brain, we can get a fair idea of the two systems' relative complexities. The optic nerve contains around eighteen times as many neurons as the cochlear nerve. It would be reasonable then to

assume that the optic nerve transmits at least that much more information (Hall, 1966: 40).

Tactile Perception

The tactile sense might very possibly be considered the oldest sense, and as such has played an important part throughout evolution. It would be sad indeed to lose one's sight or hearing, but, where the blind or deaf are considered impaired, the thought of losing one's hands is virtually horrifying and nothing can compensate for the sensory perception in the fingers. A wealth of information exists today on the tactile sense as an informative device, yet designers and engineers have totally ignored the possibilities of creating texture, in any way but a haphazard or an informal application. Psychological and social awareness have seldom been considered.

Both Ivins and Hall illustrated the importance of the tactile sense and its role in the arts and sciences. The postulates of Euclid's geometry, based on tactile-muscular intuitions, were parallelism and congruence. Not only were these postulates responsible for that geometry's possibility, but they set the limits beyond which it could not go and inhibited any sense of continuity or organic order. Witness the fact that neither Euclid nor any of his successors for nearly 2000 years exhibited any interest in proving infinity. The tactile-muscular sensations perceive things

literally "at hand"; infinity, escaping handling and linear measurement, belongs to the field of vision (Ivins, 1946: 42, 55).

Greek sculpture, long idealized as the closest man had come to creating perfection, was a full thousand years ahead of Greek painting, very little of which has survived. Where Greek painting showed slightly more feeling for the nature of the human form than that already portrayed for the previous 2000 years in Egypt, during Greece's Golden Age sculpture reached an incomparable plateau of the idealization of beauty. Hall supplied the answer to this paradox by stating that while painting is totally a visual experience, sculpture is primarily a tactile one and thus supports Ivins in determining the predominantly tactile orientation of the Greeks (1966: 78).

But where the visual and auditory systems must establish points of reference, Ivins believed that the tactile mind is very apt to be aware and think of things outside any such point-of-reference relationship, relying only on the memory of separate and distinct awarenesses. Factually objects exist in what Ivins referred to as "heres" in space, but even in situations where things are not present, the solid form of the exploring hand is aware of the fact that it is still in space, even though it touches nothing, and is always literally here. The eye cannot see empty space, for there is nothing to be seen; therefore, there is no sense of

actual contact in visual space, while tactile awareness is solely dependent on conscious contact (1946: 4-5).

Braque, the twentieth century artist, in commenting on space perception, distinguished between tactile space as a separation of the viewer from objects, and visual space separating objects from each other. Braque considered scientific perspective nothing but an eye-fooling trick--and a bad one at that--for it prevented the artist from conveying the full experience of space (Hall, 1966: 57).

Describing all the visual effects taking place with varying distance, position, and light every hour of the day, Ivins declared that the "fool-proof" tactile system furnishes the psyche with the greatest feeling of security. Tactile awareness is effected by contact and breaking contact, touch and don't touch. The hand judges an object's weight, temperature and texture, and measures the object's size in relation to that of the hand. The muscles indicate measurements that will always require the same number of movements and, barring calamity, never change in size or shape. By simply touching an object the hand knows that there is something really there, not a trick or an illusion. "The shapes of objects as known by the hand do not change with shifts in position as do the shapes known by the eye (1946: 34)."

Olfactory Perception

Man's ancestor, due to interspecies competition, was

forced to desert the ground for survival in the trees. Calling for keen, stereoptic vision, the arboreal life decreased the dependence on smell, so crucial to terrestrial organisms. Man's capacity for planning possibly has been due to this reliance on the eyes for they perceive a much larger sweep and code much more complex data than the nose, thus encouraging abstract thought. Since olfaction is deeply emotional and sensual, it leads man from the abstract (Hall, 1966: 43).

Just how much we rely on olfaction today may be illustrated by comparing the nerve-shattering experience of even temporary loss of hearing or sight with the mere inconvenience of temporary impairment of olfaction due to a cold. It might not be inconceivable to imagine this sense becoming totally extinct in man. Hall said that Americans are culturally undeveloped in the use of the olfactory apparatus due to the use of deodorants, mouthwashes, and suppression of odor in public places. Ours is a land of olfactory blandness making for undifferentiated spaces, and depriving us of richness and variety in life (1966: 43). God bless America.

CHAPTER II

SPATIAL EXTENSIONS

> . . . each animal is surrounded by a series of bubbles or irregularly shaped balloons that serve to maintain proper spacing between individuals . . . flight distance and critical distance . . . are used when individuals of different species meet; whereas personal distance and social distance can be observed during interactions between members of the same species.
>
> --Hall, 1959

As if the drawings of seventeenth century slave ships were minimal requirements of the Federal Housing Authority, man's spatial requirements have been measured for centuries by the actual amount of air displaced by his body. The fact that all men of all cultures establish invisible concentricities of various number and distance which designate their feelings, motions, and relationships should indicate that man needs space to accommodate these "extensions," the recognition of which has been increasingly more important.

Hall used the term extension to describe the various zones of involvement and their corresponding activities that man creates. In fact, he asserted that these extensions distinguish man from the other vertebrates and enable him to improve or specialize various functions. "The computer is an extension of part of the brain, the telephone extends the voice, the wheel extends the legs and feet. Language

extends experience in space and time, while writing extends language (1966: 3)." Evolution has been accelerated in the twentieth century by shifting man's body to his extensions.

The article "Space" in Architectural Forum employed an explicit example to illustrate how human relations create space:

> . . . let us imagine a picnic on a wide beach. The extent of the distance to any obstruction is for all practical purposes limitless. However, since the aim of a picnic is to enjoy group activity, the space limits itself in a preliminary way by the desire for proximity. Food is a necessary part of a picnic so the arrangement of food containers together with the number of people who sit around the food creates a space pattern. The most convenient path to the water sets a further direction and children going to play are told to keep within sight or calling distance--other limits. All of these are as clear in form and as recognized by the member of the group as if they were delineated by barriers or planes.
>
> But even in this ideally free space some volume markers may commend themselves. If the sun is too hot an umbrella will be raised. If group custom demands privacy a "surround" may be erected near the central area. Should the picnic last into late evening a fire may be built and a windbreak put up--a change in human pattern due to those cosmic time patterns, day and night. If the notion at any time occurred to one of the party to put up a fence around their functional areas, he would find that the space created by the activities inside would be roughly comparable to that of its structural equivalent, a contemporary house. In terms of space, function is, itself, form (1948: 155).

Intraspecies Distances

Hall, having studied the expanding spaces of human involvement, categorized and detailed them very aptly in The Hidden Dimension. He described linear measurements, normal

activity, and sensory accuity of six different zones created for the close and far aspects of intimate, personal, and social interrelations:

Intimate Distance

Intimate distance is the zone in which sight, sound, smell, heat, and breath of the other person accelerate sensory intake and signal unmistakable involvement with another body.

Close Phase.--less than six inches--Within this circle of love-making, wrestling, comforting, and protecting, distance receptors are used less than are those for olfaction, touch and temperature. Arms can encircle; heads may be brought into play. Vision is possible, but the image is greatly enlarged and stimulates most of the retina. Vocalization is usually minimal, a whisper often having a disconcerting effect.

Far Phase.--Six to eighteen inches--Hands can reach and grasp extremities. Clear vision of 15 degrees perceives a face as being enlarged, and its eyes, nose, lips, teeth, and tongue may look distorted. Peripheral vision of 30 to 180 degrees includes head, shoulders, and often the hands. Voice level is low if the whisper is not employed.

When crowded elevators, buses, and subways bring strangers within each other's intimate distances, defensive devices are employed to take any pleasure out of intimate

contact. Muscles are tensed, physical withdrawal is effected, one hand remains close at the side while the other grasps a railing, and a state of general paralysis is preserved. However, when sufficient space is available it is not considered in good taste for two people to exhibit either phase of the intimate distance in public.

Personal Distance

Personal distance might be called the first protective bubble one voluntarily creates between oneself and others.

Close Phase.--one and one-half to two and one-half feet--One can hold or grasp another person. Visual perception of features is no longer distorted. The third dimensional quality of objects' roundness, substance, and form is more pronounced than at any other distance. Textures are most visibly prominent. Friends and lovers might utilize this distance at loud parties.

Far Phase.--two and one-half to four feet--The limit of physical domination, since beyond four feet one cannot get his hands on another. Visual perception of another's features is normal, details being clearly visible. The voice level is moderate. Breath odor should not be detected at this distance. By keeping someone at arm's length, subjects of personal interest and involvement may be discussed.

Social Distance

Social distance is the zone in which intimate visual

detail of the face is not perceived, and no one touches or expects to be touched without special effort.

Close Phase.--four to seven feet--Head Size is perceived as normal. At seven feet the area of sharp focus extends to the nose and both eyes, or to one eye, the nose and the whole mouth. Americans will glance during conversation from eye to eye or from eye to mouth at this distance. Skin texture and hair are clearly perceived, and within a sixty degree visual angle the whole figure of another is seen. Impersonal business and social interaction occur at this distance.

Far Phase.--seven to twelve feet--Business and social relations are much more formal. Fine details of the face are lost, but skin texture, hair, teeth, and condition of clothes are readily visible. The other person's eyes and mouth are within the area of sharpest vision, eliminating the shifting of the observer's eyes to take in the entire face. The voice level is noticeably above normal and can easily carry through an open door.

The business office will utilize this far social zone for two reasons. The executive's desk is usually wide enough to keep his business associates at a formal distance. When an office caller sits within ten feet of the receptionist, she may feel bound to converse. Separated by twelve feet, she can ignore the caller without being impolite and continue her work (Hall, 1966: 110-116).

Social distance has also been examined by Mukerjee on the group level as well as the individual. In the city where men live in close proximity, they live at a great social distance. Being the outcome of sifting, gradation, and specialization, social distance measures position and power in human relationships. Seeking its own habitat, each group maintains its own occupations, kinds of food and social manners, and appropriate distance from other groups and classes. Such social positions help population maintain an average stability (1940: 137).

The segregation of each social group and utility in a definite area stamps itself on the living standards and the social behavior of the urban dweller. Moving from residence to residence and job to job, people seem to be directed by rapid increase or decrease in wealth and height of social position. Where each social group becomes less rigid and more open, the social distances between the groups become sharper (Mukerjee, 1940: 122).

Interspecies Distances

May et alii asserted that distance has many "phenomenological implications" in addition to the normal experienced distances, and they mentioned the concepts of symmetry and asymmetry, the symbolic meanings of left and right, the distance a neurotic will erect between himself and his fellow men, the world, or his life goal (1958:114).

Minkowski, the psychologist, analyzed experienced distance as the free space man normally feels surrounding him and giving him "amplitude of life." Such a feeling dwindles to non-existence in many neurotics and schizophrenics (1933: 366).

In Existence the editors define two spacial concentricities utilized today less by man than by the remaining vertabrates. Animal psychologists describe flight distance as the zone in which a self-protective warning is triggered causing the animal to take flight from an approaching predator; critical distance, much smaller in circumference, is the zone in which the animal turns from flight to assume the offensive. Because the radius of both distances will vary with each species and may be accurately measured within the inch (1958: 114), there must be a positive correlation between the animal's size and its established interspecies distances.

Hall indicated three distinct zones instead of two. Agreeing that flight distance is "the basic mechanism of survival for mobile creatures," he re-defined critical distance as a narrow concentricity that separates flight distance from attack distance, the third separate zone (1966: 12). The difference between the critical and attack zones may be illustrated simply and familiarly by the family dog with a prized bone. Flight distance may go unobserved when only the family is around; however, once a person is

inside his critical area the dog will growl and bare his teeth as a final warning, yet make no effort to attack. Only when it is evident that within the small attack zone a hand may seize the bone, will the dog make an overt attempt to defend it. The same warning signals may be observed in the wild animal acts at the circus. The lion is not so much trained to hop when the trainer says jump, as the tamer is primarily observing the distances the animal instinctively creates in self-preservation.

It may be assumed that if man's extensions have permitted him to think in the abstract, consequently refining his emotional and sensual reactions, his instinct of self-preservation might be more effective on his thought than on his actions. Certainly, his actions would be more restricted by his domesticity than would those of the wild animal. Assuming this, the physical flight distance might be observed in man's neuroses and his former critical-attack distance possibly has evolved into psychoses.

If these distances established as means of survival are no longer an important part of the human spatiality system, it must be indicative of the spatial restrictions imposed by the highly dense population of modern life. For flight reaction to function properly, there must be sufficient space for it. By taming the higher organisms, by providing a feeling of security, and by their learning to control aggression, they may now be neatly packed into a

given area. Fear, however, can resurrect the flight reaction, "creating an explosive need for space. Fear plus crowding creates panic (Hall, 1966: 175)."

Barring thought of man's struggles of accidental and intentional violence in every day city living and finding the worry about nuclear war as useless as worry about the sun rising on the morrow, the chief common fear today may be that of air attacks during acts of war. Any current history of World War II will bear out the fact that more people died from the bombing of Dresden than from the more infamous method employed on Hiroshima.

Sigfried Giedion punctuated man's flight-critical-attack distances as a contemporary problem. "Great cities sprawling open to the sky . . . are invitations to destruction." Being practically indefensible, the best means of their defense is the construction of "great vertical concentrations which offer a minimum surface to the bomber (1959: 721)." Certainly it would appear that the flight distance has altogether vanished, and that the critical distance is no longer man's final stand, but a target behind which he is entombed.

Territoriality

All living organisms possess some form of envelope that indicates the organism's physical boundary and thus separates it from its external environment. Beyond the

physical bounds lies another boundary, non-physical but just as real and equally important. This invisible boundary has been called the organism's territory.

The zoologist, Hediger, stated that the first property any organism has is the space it occupies (Hall, 1967: 165). Apparently, as the organism grows, so will his territory, eventually to encircle a refuge, a mate, and offspring. In any given stage of life, the boundaries of the established territory will usually remain constant for the purpose of fixing the locations for such specific activities as sleeping, eating, and nesting. The territory is virtually an extension of the organism and is marked by visual, vocal, and olfactory signs (Ardrey, 1961: 40).

Apparently, all vertebrates have the habit termed "territoriality" by anthropologists. Birds have well-developed territoriality and return yearly to areas they defend as their own. Dolphin and whales use the same breeding grounds, and individual seals have been known to return to the same rock every year (Hall, 1959: 147).

The family dog offers marvelous examples for observing self-unconscious territoriality at close range. Inside the house there is always one particular spot to which the dog will return after every foray to the front door, to the kitchen, or, perhaps, to the back door. He will silently enjoy gnawing on a bone until someone sets foot inside an invisible circle the dog has drawn about himself, then the

bone is dropped and a low growl grows in volume as the trespasser nears. Outside, the dog traditionally knows the boundaries of his master's yard and defends them against trespassers. He knows that the street belongs to the city and is therefore public property, and it seems to be the logical place for him and his group to gather and chase cars, until they get tired and lie down in front of them.

Over the millenia the purposes of territoriality have been to guarantee each animal a place to court, mate, and rear its young, to assure each animal its share of the available food supply, and to provide a place of refuge from predatory attacks. Man observes the process of territoriality as zealously as, if not more than, any other vertebrate and has invented numerous ways of protecting his claim with fences, "no trespassing" signs, boundary markers, door and window locks, and shotguns--the legality of which he has also established. Not only must man defend his property, encompassed by visible and invisible markers, but also the material extensions of himself and his territory (Ardrey, 1968: 156). The tenet "man's home is his castle" has been a part of English common law for centuries and Americans are protected by the Constitution from unlawful search and seizure by government officials.

When the less dominant animals are unable either to establish or to defend a territory successfully, they are exposed to predation, thus reinforcing dominance in

selective breeding. In some species, territoriality serves to localize waste disposal and discourage parasites. But the most important function of territoriality, on which all other purposes vary in degrees of dependence, is proper spacing which guards against over-exploitation of the environment on which the species depends for its sustenance (Hall, 1967: 165).

Competition

While the consequences of crowding are generally condemned, Mukerjee declares that as evolutionary processes, the resulting stresses and intraspecies competition must be considered as positive necessities (1940: 120). Most of us are familiar with interspecies competition as nature "red in tooth and claw," but competition within a species refines the breed and enhances its characteristic features and incipient form (Hall, 1966: 36). Recently, ethologists have taken the stand that interspecies competition is equally valuable as a positive necessity. Predation seems to be a paradoxical symbiosis. The relationship of a predator to his prey is the inverse of that of a parasite to his host. In the latter instance the parasite kills off the strong; whereas, the pressure of predation acts to improve the species by eliminating the weak (Hall, 1966: 20).

The results of competition are structurally important in a study of spatiality. According to recent ethological

reports and pathological studies when intraspecies' aggressiveness occurs, more space is necessary. If population density is approaching its maximum, space for expansion is no longer available and a chain reaction begins. Aggressiveness, sexual activity, and the accompanying stresses are blown out of proportion and overload the adrenals. Primarily as a result of the excess strain, the population suffers a collapse due to reduction in the fertility rate and an increase in susceptibility to disease and inevitable mass mortality. Through such processes the dominant animals are not only under less strain from the start, but they are the odds-on favorites to stand more stress as long as the competition lasts (Hall, 1966: 35).

Density

Density is regulated by territoriality for the purpose of propagation. By providing a properly spaced framework for learning, playing, rest, and protection, groups' activities are co-ordinated and held together. Animal societies "build up until a critical density is reached, thus creating a crisis that must be met if the society is to survive." The assumption that both increase and decrease in population of any species are controlled by a response to density concludes that "as numbers of animals in a given area increase, stress builds up until it triggers an endocrine reaction that acts to collapse the population (Hall, 1966: 15)." The

critical distance discussed earlier may also be defined in a pre-aggression sense as simply critical space, the minimal space requirement of any organism, without which healthy survival is impossible.

Mukerjee indicated that density transforms loose hordes of families into society, improving social organization and division of labor, and effects a social heritage. Once established, the society will rearrange the density of its spatial distribution, occupation and social stratification (1940: 119).

Somewhere in the meanderings of the article entitled "Space," the writer repeated an old Spanish proverb: "Crowded caves lead to murder; solitude to madness (1948: 159)." A Spanish proverb thus reinforces an Indian's dictum that "population needs as much concentration as dispersal (Mukerjee, 1940: 159)."

Overcrowding

In dealing with heavy density of population, Mukerjee asserted that when overcrowding is present, the combination of rapid turnover in residence and employment, changes in economic and social position, and the sped-up tempo of life, all brought on by density, have the tendency to multiply the aggravations of overcrowding itself. Economics and social position dictate the territorial distribution of individuals, groups, and institutions. Man jostles fellow man for

position in space and time, resulting in secondary, impersonal, and intellectual relationships of an abstract nature (1940:137).

When rural inhabitants move into the city, they are forced to adjust to an entirely new way of life. The differences in the tempo, conversational exchange, involvement, ad infinitum, of the city and rural area are supposedly legion. Country folk are faced with the problems of strange communication systems, uncongenial spaces, and the pathology associated with overcrowding (Hall, 1966: 155). The problems of the Southern Negro moving to the Northern ghetto must be the most flagrant example. While the living conditions, per se, for each family are probably no worse in the cities, the additional stress of being overcrowded in a high-rise slum may easily be the chief cause of the unrest.

The Hidden Dimension cited the results of a recent report by Ratcliffe and Snyder, pathologists at the Philadelphia Zoo's Penrose Laboratory, demonstrating that a wide variety of animals suffer the same diseases as man when they are stressed by overcrowding. In this twenty-five year study of 16,000 birds and mammals, cause of death was either high blood pressure, heart or circulatory diseases even when a low-fat diet was maintained. Hall qualified this report by reiterating that domesticated man does have his extensions to help screen his senses, an advantage unknown to the other vertebrates. By screening he can eliminate some of

the stress of overcrowding, but the ultimate build-up can still be lethal (1966: 174).

The Black Death of the mid-fourteenth century is one of the most notorious instances that illustrate the effects of overcrowding. Following a period of rapid population expansion, the Black Death lasted from 1348 to 1350 and, over this two-year period, brought about the demise of two-thirds of Europe. While the plague's direct cause was bacillis pestis, resistance to it was considerably lower in the stressfully crowded medieval towns. Apparently there is little agreement about the reason the plague ended, but definite social and architectural changes, which solidified family life and stabilized political conditions, must have reduced the stress to a large extent (Hall, 1966: 174).

While there is probably nothing pathological in crowding by itself to produce disease and the ensuing lethal effects, it is a definite cause of social disorganization, population collapse, and large scale extermination (Hall, 1966: 29). As in gravity, the influence of two bodies on each other is inversely proportional, possibly even to the cube rather than the square of the distance between them. As stress increases, man becomes more sensitive to crowding, "so that more and more space is required as less and less is available (Hall, 1966: 121)."

Fixed-Environment

Without question, one of the oldest assumptions about a fixed-environment is that it forces the organism either to adapt or to perish. Ittleson said this old view is rapidly being superseded by one which emphasizes the organism's creative role in shaping its own environment. "The malleability of the environment in the face of determined onslaught by groups of organisms" has come to the fore as an accurate interpretation (1960: 24).

The relationships of man to his environment is simply a continuation of man's established extensions and his awareness of his intraspecies distances. Having discussed the micro-spaces which living organisms create to organize their personal space, it might not be an incorrect assumption that the order of nature should dictate that the minimal shelter be a predetermined power of the micro-space. A formula might thus be presented as volume of the environment equals the cube of the micro-space per organism. There is bound to be a rational relationship between the two.

In The Architect and the City a pertinent excerpt from a basic anthropology course is interpreted. The problem of the shelter is an aspect of the behavioral decision process existing in various forms of insect and animal life. Among the lower species the decision mechanism is biological, coming as standard equipment. Hives, burrows, webs, nests, cocoons, dens, and lairs are elaborate results of

purely instinctive processes. However, man lacks biological decision to a great degree; thinking abstractly he employs greater adaptability and flexibility in solving his shelter problems (1962: 144).

During a debate over the restoration of the House of Commons after World War II, Sir Winston Churchill said, "We shape our buildings, and they shape us." Fearing a departure from the traditional spatial patterns of the House would seriously alter the patterns of government, Churchill was undoubtedly well aware of the role of man's environment, or what E. T. Hall terms the "fixed-feature space." Fixed-feature space is described as one of the basic ways of organizing activities on the individual and group levels. Including man's material extensions, as well as the invisible ones that govern behavior, the fixed-feature patterns manifest themselves in buildings and the multiplication of buildings (1966: 97).

Houses throughout the world have some modicum of spatial organization, formal or informal, open or closed. Where Hall indicated throughout The Hidden Dimension that there are cultural or proxemic differences in all phases of human extensions, it may be assumed that the common denominator of mankind will effect some similarities in the same way that man's senses co-operate and perceptual agreements must exist among men. Such accord among cultures might lessen the present problems of interrelating if more tolerant views of

separate cultural dimensions were observed and appreciated for their uniqueness.

The cultures of what is termed Western civilization should be qualified as Western European and their colonial cousins. With the exceptions of the most impoverished slums, the interiors of Western houses are spatially organized. Not only are there specific locations for the numerous functions of entertaining, cooking and eating, rest, procreation, and sanitation, but each room or area is given a specific name indicative of its function--living room or lebensraum, dining room or sala da pranza, bedroom or chambre. When the separate functions of these rooms become dislocated and spill over into the others, it is apparent that there exists a failure to unify and catalogue spatial functions according to a consistent, predictable plan (Hall, 1959: 97). It might also be apparent that what that family needs is some organization.

In the hands of a fanatic, classification of function can reach the point of absurdity. Some homemakers are more easily defined as line foremen than as hostesses, as they rigidly organize their most portable household items with all the flexibility of an assembly line. Guests who move even light chairs or ash trays may find such a precise atmosphere as inviting as the nursery of a mother wolf. Hell hath no fury like a zealous housekeeper.

In Centuries of Childhood Philippe Ariès indicated

that the present internal layout and nomenclature of fixed spaces are relatively recent in development; however, his opinion must be qualified as being only half right. The ancient Romans who lived 1900 years ago, employing names as well as assigning definite purposes to their rooms, were certainly closer to the present by a millenium than they were to the period of the great pyramids at Gizeh, and fixed spaces therefore are newer than the wheel. But Ariès was of the opinion that fixed-feature spatiality, like the restaurant, has been in existence only a little less than 300 years. He asserted that with a totally "new desire to keep the world at bay," stemming from the Age of Enlightenment, rooms were arranged to open into corridors rather than into one another (Ariès, 1962: 398).

Sherrill Whiton, like any authoritative design historian, described the Roman triclinium (dining room), tablinium (library), and exedra (drawing room) as being not only named but equipped with only the furniture most necessary for each room's individual purpose. A dining room was provided with a large table and small couches; a drawing room had only small tables and chairs; the bedroom contained a bed, the dressing area being adjacent to the bedroom. The atrium and peristyle served all rooms in circulation and ventilation, and as such have effectively remained as the courtyards of Southern European cultures (Whiton, 1967: 66).

Probably the atmosphere of total disorganization

which ended during the 1700's, according to Ariès, did not achieve prevalence until well after the fall of Rome in 476 A.D. It would seem improbable that any of the ancient civilizations, employing hierarchical systems of rigid echelons based on slavery and with absolute monarchs at the social apex, might utilize anything but a rigid system of room divisions--at least in the villas that had more than one room. During the Middle Ages, however, historians generally tell us the only differences between a castle and a cottage were the larger size of the castle and the relative comfort of the small cottage.

Both medieval king and commoner lived in the unparalleled informality--to be kind about it--of one large room furnished with folding stools and chairs and trestle tables. Usually the larger castle would have separate sleeping quarters, but most dwellings of the Middle Ages saw as much of privacy as Godliness saw of Cleanliness, a condition that improved very little far into the Baroque. Thus it might be more correct to assert that in the middle of the eighteenth century with the emphasis on etiquette and formality and the interest in neoclassic detail, there occurred a <u>revival</u> of fixed-feature spatiality once utilized by ancient Rome.

Today the ominous return in part of Gothic handling of space was indicated by Hall when he observed, ". . . the separate dining room is fast vanishing from American houses," although "the line separating the dining area from the rest

of the living room is quite real (1966: 100)." For with the advent of the twentieth century, Einstein's theory of relativity and its effect on spatial concepts; Cubism and its effect on spatial interpretation; and the architecture of Le Corbusier, Frank Lloyd Wright, Mies Van Der Rohe, and many others, and its effect on spatial organization, logic and function might be used in spatial design to determine man's fixed environment as a natural extension of his form, his cultural patterns, and his dreams.

CHAPTER III

SPACE AND TIME

> Henceforth, space alone or time alone is doomed to fade into a mere shadow; only a kind of union of both will preserve their existence.
>
> --Herman Minkowski, 1908

Before the first decade of the twentieth century was over, the physical sciences had experienced a thorough tremor. Giedion in Space, Time, and Architecture described a new conception of time as the most revolutionary "change . . . since the era of Aristotle and the Pythagoreans." For the past twenty centuries or so the conceptions of time had been dealt with in one of two ways: the realistic--that of time existing unobserved, independent of any other existence, unrelated to any other phenomena; or the subjective--having no existence without observation, entirely dependent on sensory experience (1959: 439).

For an equally long span, the physical concepts of space had been observed, theorized, and defined. The Babylonians and archaic Greeks had visualized "the absolute up and down." In succession, Parmenides defined space as a finite sphere, outside of which there could be neither something--since all being was inside--nor nothing--since nothing could not exist--and at the center of which was the earth. Galileo and, later, Newton advanced the concept of a

homogeneous and infinite space, "a sphere whose center is everywhere and its periphery nowhere (May, et al, 1958: 108)." Suddenly all of these theories became antique curiosities.

Relativity

The concept of time was incorporated indivisibly with the concept of space in the careful definition of simultaneity by Albert Einstein in his famous work, Elektrodynamik bewegter Körper, in 1905 (Giedion, 1959: 432). Einstein was, of course, a physicist, but his proposal of relativity is so universal in application that it has become as elemental to the arts as to the sciences of the twentieth century. The contemporary architect correlates the laws of function and esthetics with the law of relativity, which states that "volume and energy around us not only modify each other according to certain laws," but that these laws, in essence, "are modified and changed by other, more fundamental laws (Space, 1948: 155)."

Applying this conception of simultaneity to architecture, it may be affirmed that not only does space include the elementary relations of length, width, and height, but the equally elemental light, heat, sound, (Space, 1948: 155) and most important of all--motion. The element of motion is essential to architecture, for without this fourth dimension --without the time taken to explore--there can be no

experience, no appreciation for an infinite number of scenes. It is man's own movement that generates the physical and dynamic element beyond the third dimension (Zevi, 1950: 27).

The Fourth Dimension

Trying to picture the fourth dimension as a totally new direction in which third dimensional forms can neither point nor move is as useless as trying to figure one's income tax on a tape measure. It may be possible, but it is simply the wrong standard of measure. However, if it is thought of as a principle of growth or change--a measure of relations inexpressible in terms of length, width or depth--the concept falls into its proper place (Bragdon, 1923: 25).

Since the fourth dimension is undeniably immeasurable by any present means and, as such, is highly conjecturable, for the purposes of explanation imagine a world of only two dimensions in which a third is known to exist but is totally incomprehensible. The plane-world, as Claude Bragdon described it, is populated by plane-people of only two dimensions somewhat resembling paper-dolls whose edges only touch when they meet. Arms never embrace; hands don't even shake. They live on a plane-world of no more depth than a preschooler's landscape, a world in which even the trick of perspective is unknown and unnecessary. Consequently, three-dimensional objects passing through this plane-world would

manifest their inconceivable third dimension as a principle of growth or change, or a measure of relations inexpressible in terms of mere length and width (Bragdon, 1923: 25).

Should a sphere--a simple enough object in the world of three dimensions--cross through a two dimensional surface, the plane-world, it would manifest itself in the plane as a point, expanding to a circle which would attain a maximum diameter equal to that of the sphere, after which it would shrink to a point and disappear (Bragdon, 1923: plate 14). Thus, by analogy, the fourth dimension, implying spatial expansion toward some indeterminate direction from the three known dimensions, "would manifest itself to our perception equally as a time change (Bragdon, 1923: 25)."

As if four dimensions were not enough to consider, Bragdon revealed that there are probably an infinite number of dimensions. Referring to Immanuel Kant, the philosopher, for support, Bragdon theorized that if it is possible that there are developments of other dimensions in space, it is also very <u>probable</u> that God has somewhere produced them (Bragdon, 1923: 27). Once the principle of growth is realized as the fourth dimension, then the principle of motion, whose amplitude varies widely as that of growth throughout all of nature, presents the "idea of spaces of different dimensionalities, each added dimension corresponding to a power of motion in a new direction (Bragdon 1923: 15)."

Cubism

At the beginning of the second decade of the twentieth century, there occurred in the arts a new conception of spatial representation. Cubism, furthered by the conception of the fourth dimension, was the result of painters' and sculptors' almost scientific investigation in studio-laboratories of the "ways in which space, volumes and materials existed for feeling," offering architects the "means of organizing space in ways that gave form to contemporary feelings (Giedion, 1959: 26)."

Colors and textures through collages assumed a unique importance for which they had heretofore never been employed. During the last half of the nineteenth century, the Impressionists and their successors had broken from the Academy and fostered a freedom in art that was essential before Cubism could evolve, Einstein or no. Monet had searched for a sequence in time when painting the cathedral at Rouen, but only the totally free tenets and the spatial relationships developed from Cubism could furnish the "plastic principles of present-day visual approach (Giedion, 1959: 430)."

Color, no longer dependent on naturalistic representation for its effect, was granted a life of its own, a right to exist as itself. Chagall, Miro, and Kandinsky were all aware that "red, blue and green--come to a focus at different points in reference to the retina and that extreme depth can be achieved with color alone (Hall, 1966: 82)."

The artist, Braque, is best known for the textural quality of his paintings. By conveying the space of touch and appealing to the tactile as well as the visual senses, their essence is virtually lost in reproductions. "It is the texture that pulls you in close so that you are in reach of the objects he has painted. Properly hung and viewed at the correct distance, Braque's paintings are incredibly realistic (Hall, 1966: 82)."

Paul Klee must rank toward the top of the list of the four-dimensional artists. In describing his own method of approaching the design elements, Klee indicated his starting point was where all pictorial form began, with the point setting itself into motion and describing a line--the first dimension. With the shifting of the line to form a plane, the second dimension came into being. A clashing of two-dimensional planes gave rise to a three-dimensional body. "'The line moves and produces a plane: the plane moves and body comes into being' . . . . the body reduces to the point, and so starts on its journey afresh, invading the volume of the next dimension (Bacon, 1967: 48)."

The Space-Continum

Zevi in Architecture as Space accredited the development of the fourth dimension of Cubism for being the impetus of Le Corbusier's "Villa Savoie" built in suburban Paris. The villa, designed with four equal façades and suspended on

pilotis, destroyed the century-long distinction between main, lateral, and rear elevations "so implicit in perspective representation (1957: 167)."

Le Corbusier's term of "ineffable space" rapidly became irrevocably interconnected with those of simultaneity, the fourth dimension, the space-time concept, and most particularly the space-continuum. Expounding on his dictum, Le Corbusier said:

> Once you have grasped the notion of space as a fullness--a plenum of something--you will see . . . the inevitable corollary that space is naturally and patently a continuous whole, reaching out in all directions from any given point to far beyond the largest community of men (Licklider, 1965: 196).

Whether Le Corbusier gave Cubism the credit for his inspiration or indicated that Cubism was the overture to his opera is anybody's good guess.

Whatever the case, space-continuum seems to be most applicable of relativity's by-names to the subject of architectural design. The observer's views are organized about "evolving nuclei," shifting with his movement, and are comprehensible as a continuum only from "a series of different positions seen at different times (Licklider, 1965: 196)."

As Licklider saw it, the purpose of designing in accordance with a space-continuum is neither because it is a "better way to design" nor a "convenient way to work." Rather, the purpose is the "free choice" of all the more limited kinds of imagination and conception. However, the

choice of the less inclusive may be taken only after the comprehensive and expansive approach of the continuum has become part of a designer's repertoire (1965: 196). When he designs architectural spaces, there is no reason why the designer may not infinitely extend, juxtapose, and perforate them about an evolving nucleus.

Regardless of how rooms are designed in relation to each other--whether as a continuum or merely as an enumeration--the observer is limited to one place at a time, and walking through them he will experience a continuous sequence in time. When the whole sequence is planned "to contribute a distinctive character" the observer will experience a "unifying conception of a harmonious suite (Licklider, 1965: 160)." When little thought is given to the total design, little more than a sum of encounters is gained. It becomes rather like a luncheon of liverwurst and grape jelly on rye, with a side order of zuccini, and a bowl of whipped cream for dessert--the puzzle lies not in each item served, but in why they were served together.

The spectator's scope of vision integrates all that he can see through doors and windows, inside and outside, into one visual unit. Therefore, the shapes, hues, and spaces of one experience should open harmoniously into a second and a third, ad infinitum. Hence, the designer should never forget that one architectural space overlaps another and both overlap the scope of nature. When a suite

of rooms is designed to join successively in an observer's mental organization, his conception of one room "has only to be modified or developed," as he passes into the next, experiencing not a sharp differentiation but an evolution of spatial conceptions. "As the spectator moves," and his scope of vision shifts toward new shapes, colors, and distances, "the volume that serves as the nucleus of his visual experience also moves and shifts (Licklider, 1965: 161)."

The designer must inescapably work in time and space; whether or not he works well is another problem. The good designer conceives of pulsating forms and expressions of vitality that flow through a structure, composing the physical realization of an idea previously implanted and envisioning the development to come, in comparison to interweaving symphonic themes in which one "interlocks with another in the flow of time (Bacon, 1967: 23)."

Once the designer has considered all the possibilities of a space-continuum within a building, next he should consider their relationship to man and their proportions to the adjacent land- or city-scape. The space-continuum, by its very nature, necessitates a conception of the total area of the visual field, extending from a building's interior-exterior and sweeping beyond nearby landmarks to the horizon.

Giedion suggests "the right of the pedestrian" as an inspiration to the designer's spatial imagination and its

point of departure. "It is indispensable for man's equilibrium that he should have the feeling that everything in the urban setting has been conceived for him to his own human dimensions (1958: 94)." The observer's mode of perception, his impression of sizes and defined spaces, is not only the basis for the space-continuum but for human scale, also. In the abstract, the human figure as an appropriate measure in a limitless world may be compared to the golden section sequence which "sweeps from zero to infinity with an unbroken regularity, thus paralleling the endless coils of the space-continuum (Licklider, 1965: 165)."

Zevi referred to "the human parameter" as being interior and exterior human scale. The internal and external character of any architectural space and volume are solely determined by "the fundamental factor of scale, the relation between the dimensions of a building and the dimensions of a man." A building is either qualified by its scale or rejected for its domination and independence of man (1957: 56-57).

From the anthropologist's standpoint, Hall stated that relatively little is known today about the abstract qualities of scale. He believed that scale, as a dominant factor in housing and town planning, represents a frontier in human requirements that must be dealt with and understood, "for it directly affects the judgment of what constitutes proper population density. Scale is as much a blind

spot as the unknown basic rules for estimating the proper size of a family dwelling." Rich and poor alike are at the mercy of speculative builders, ignorant and careless of scale and its effect, who "shave six inches here and a foot there to lower costs and increase profits (1966: 161)." His concern for six inches may seem to be a rather picayune point at first thought. However, if consideration is given to the width of a small bathroom, six inches might determine the difference between comfort and claustrophobia.

In discussing scale, Bacon indicated its importance to the problem of space design most aptly when he said: "Underlying it all is the modular rhythm of footsteps, the unchanging measure of space since earliest civilization (1967: 20)."

CHAPTER IV

SPATIAL ENCLOSURE

> The human organism progresses in its capacity to perceive space from the spaceless embryonic state, through the limited space exploration of the infant, to the primarily two-dimensional exploration of the crawling child, and finally to the bodily leap into space essential to the athlete's skill and the dancer's art. There is an intellectual parallel of deepening perception which is based on becoming connected with larger and larger systems. In architectural terms it means progressing from the earth and earth materials into the less tangible elements of the universe. Through this sense of connection with a system greater than himself, man achieves aesthetic satisfaction, and the more nearly universal the system, the deeper the satisfaction. This is why a conscious expression of space is essential to the highest expression of architecture.
>
> --Bacon, 1967

To inquire deeper into the "indissoluble union between the human form and architecture and the strengthening of their relation," the main concern of architecture should be spatial enclosure--not a lump of masses but a combination of varying contours of hollow shells (Zevi, 1957: 224). It must be agreed that the interpretation of the success of the building's enclosure is the interpretation of the chief element of architecture.

Of all the arts, it is architecture's peculiar province to surround man with a three-dimensional void in which he may stand, turn, walk, sit, and recline. While architecture holds much in common with sculpture and more with

music, it affords one unique pleasure: the "monopoly of space," and the delights derived therefrom. Klee's paintings depict space; Shelley's poetry recalls its image; Copeland's music presents its analogy; but architecture deals directly with space, using it as a material, setting man in its midst, and giving space its full value (Scott, 1954: 168).

Because space exists as a void, "a nothing--a mere negation of the solid," it is overlooked, and its effect on man's spirit and his pleasure derived from architecture are ignored. The enclosure of space is the object of the building. As stone is the medium of sculpture, so is space the medium of architecture meant to "excite a certain mood" in those within its shell by appealing to movement. Offering the freedom of movement, space becomes valuable upon entering man's physical consciousness. Instinctively he adapts, projects himself into spaces, and fills them with his movements (Scott, 1954: 169).

Spaces of symmetrical proportions that agree with the proportions of the human body tend to give man equipoise and control by inviting him to move in no singular direction. By being equally drawn into the center and back again in all directions, his consciousness draws its parallel with the expansion and contraction of man's own regular breathing. Such spaces obtain a sense of beauty "through this elementary sensation of expansion (Scott, 1954: 170)."

Without a doubt, "space value in architecture is affected first and foremost . . . by actual dimensions," but linear measurement is not the only criterion. Light and shadows attract the eye and suggest independent movement. Each color creates its own distinct spatial sensation. The relation of the previous space to the present one effects their appreciation. Vertical lines create an illusion of great height; horizontal lines create one of greater breadth. Projections in plan and elevation alike may "cut the space" and create the illusion of several rather than one (Scott, 1954: 170).

Scott, in accord with Licklider, concluded that there are no liberties which the designer may not take and nothing to serve him as well as "the fullest power to imagine the space-value resulting from the complex conditions of each particular case." His opinion that architecture is not machinery but art, induced him to state as well that there is not one fixed ratio that may not fail the designer (Scott, 1954: 171).

Physical Environment

Not only is architecture a part of art, but also a part of life, dependent "more than any other form of art upon the will of the public (Giedion, 1959: 533)." Indeed, it must be the same willful public that clings to the tastes of any century but the present, or the styles of any country

but its own. It is the public which determines what is built. Contemporary builders are in business to make money, not to glorify a more elegant epoch. In the United States in 1969 man can have anything he can pay for, and builders would put up igloos in El Paso if there were a market. Hopefully, the public will awaken some day to the fact that the 6000 year old post-and-lintel, foursquare construction became anachronistic with the advent of the twentieth century. Giedion says that in architecture, "the standard of values of the client is as important as the standards of the builders (1959: 533)." He seems to have intended an idealogical statement, but it nonetheless stands as a critical evaluation of today's building trends.

Zevi asserted that while "internal space is the essence of architecture" it must not be considered the sum and total value but the most important, ahead of economic, social, technical, functional, esthetic, and decorative elements. However, space as the natural protagonist of architecture creates "the stage on which our lives unfold (1957: 32)."

Bacon, in agreement more or less with Zevi, described architecture's purpose as being "to heighten the drama of living." Not only must architecture provide for different activities in differentiated spaces, but "articulate them in such a way that the emotional content of the particular act of living which takes place in them is reinforced (1967:

19)." Quite simply, the physical actions a given space allows will determine the spatial experience. A ceiling beyond reach will evoke a response quite different from that afforded by a ceiling eight feet high. A room requiring ten strides to cross will be experienced differently from a room requiring three or four. Hall observed that man's perception of space is dynamic because he relates the space to action rather than observation (1966: 108).

> It is one thing to delimit space by structural devices such as walls. It is quite another to infuse the space with a spirit which relates to the activities that take place in it and which stirs the senses and emotions of the people who use it. Architecture encompasses both (Bacon, 1967: 18).

Architectural form is the point of contact between mass and space, and their interrelation is the essence of design. If their union is not stated clearly and cleanly, the form will be unclear and a failure, for by equally considering both mass and space, the designer is "making a statement about the interrelationship between man and his universe (Bacon, 1967: 15)"--about Life.

Life is unquestionably an experience-continuum, since each moment of life has been preceded by one experience and in turn precedes another. Equally undeniable is man's desire for happiness--or the achievement of a harmonious experience-continuum. The parallel is obvious: to further a harmonious experience-continuum for man, architecture must be designed as a harmonious space-continuum. The purpose of

architectural design is to affect the people who use it by "assaulting their senses" in a "continuous unbroken flow of impressions" as they move through it. "For a design to be a work of art, the impression it produces . . . must be not only continuous, but harmonious at every instant and from every view point." Architecture must assume its position in the arts alongside poetry and music, "in which no single part can be considered except in relation to what immediately precedes or follows it (Bacon, 1967: 19-20)." Thus Bacon compounded man's dependence on redundancy, his sensory perception, his extensions, and his comfort in graceful rhythm.

Esthetic Environment

Zevi, throughout Architecture as Space, kept redefining space as architecture. At one point his contention is that beautiful architecture would be "architecture in which the interior space attracts us, elevates us and dominates us spiritually"; ugly architecture would consist of disgusting and repulsive interior spaces (1957: 28). He further qualified his position by stating that while it is incontestable that beautiful decoration will never create beautiful space, satisfactory space which is meanly augmented will never create an esthetic environment (1957: 30).

The problem of esthetics may not be as urgent to modern life as proper space design, but in putting "first things first" we should not forget that second, third, and

more things must follow or first is left alone--becoming first, last, and lonely. Bacon said, "By the building of a blank wall . . . a space is defined, but it remains a characterless space" awaiting the injection of "rhythm, texture, and spirit . . . by architectural means (1967: 18)."

If architecture is an art--as well as Le Corbusier's "machine for living"--then as all art must, architecture must have harmony, proportion, eurhythmy, and character but in spatial values of esthetics, as sculpture must have them in tactile values. When architecture is said to have "non-limited space," "perspective space," "pictorial qualification of surfaces," "spatial infinity and chromatic values," "atmospheric depth," "linear interweaving against a void," "continually varying relationships between color planes and chiaroscuro-depths, wall masses and masses resolved in surfaces," esthetic definitions of a unique building are being made (Zevi, 1957: 214).

Just as man--his diverse activities, spiritual nature, and material and psychological needs--is vitally integrated in body and soul, so must his architectural extension be unified in form and characterization.

Psychological Environment

Man--over all other organisms--has achieved the greatest control over his environment through the development of his extensions. However, where his technical

ability in creating his physical environment is widely known, his flexibility in creating a psychological environment is relatively obscure. Man creates for himself a common physical environment through which all men act; "each man in his individual aspect creates for himself the psychological world within which he has his life's experiences (Ittleson, 1960: 24)."

Where Hall said that ". . . the same spatial settings trigger different responses in people and the individual is not even consciously aware of them (1967: 164)," Ittleson explained. He stated that perceptual interpretations are manifest through "concrete individuals dealing with concrete situations" and as such must be observed as transactions. With such transactions, a person's perception is dependent on both his own position in space and time and his own combination of experiences and needs--his own personal behavior center. The perceiver attributes "certain aspects of his experience to an environment" that he believes is an independent existence, thus creating his own psychological environment (1960: 12).

Man's physical environment and psychological environmen may never be considered to operate separately and independently; they are interrelated and should be considered as "different ways of looking at the same thing." The psychological environment a person creates will be influenced by the physical world he encounters; similarly the physical

environment he will create depends on the psychological world he has perceived, the only world he has known (Ittleson, 1960: 25).

Of all architectural interpretations regarding space, the theory of Einfuehlung, or empathy, as a scientific analysis of the ego, is of definite interest in dealing with spatial psychology. The theory is simply that a spectator will identify his form correspondingly with those in architecture, transcribing his feeling into structural forms while humanizing and animating those forms viewed. Zevi, rabidly devoted to the organic school, declared this theory an attempt to "reduce art to a science" in which "a building becomes nothing but a machine for producing certain predetermined human reactions (1957: 188)."

The grammar of Einfuehlung consists of "rhythm," "contrast," "symmetry," and "proportion"--words found in many formalistic interpretations. Nonetheless, Einfuehlung --interesting to note and apparently not disproven--applies geometric elements of line and shape to architectural form:

Horizontal lines symbolize the immanent, the rational, and the intellectual. Parallel to the earth, the horizontal accompanies man's movement.

Vertical lines symbolize the infinite, ecstasy, and emotion. Deceptive in length, the vertical is a symbol of the sublime.

Straight lines signify resoluteness, rigidity, and

strength.

Curved lines represent hesitancy, flexibility, and decorative values.

The circle affords the sense of equilibrium of control over life.

The cube, of equal dimensions and immediately comprehensible, represents integrity and presents a feeling of certainty.

The ellipse, having two centers, represents unquiet by keeping the eye moving.

The sphere, as well as the hemisphere, represent perfection, the final conclusive law.

The spiral symbolizes ascension, detachment, and freedom from earthly matters.

The juxtaposition of geometric forms symbolizes dynamism in a space-continuum (Zevi, 1957: 189).

Aside from individuals who suffer from agoraphobia or claustrophobia, described in Existence as having a disturbed spatial experience, everyone has to some degree, if not a phobia, at least a preference in dealing with space. Where one person strives to conquer and explore space, another stands to keep and defend it. A third will organize and utilize it, while a fourth wishes to delineate and measure it. One can be rooted, another wandering. Some wish to "make themselves broad" with a large room; some "constrict themselves" and are content with "narrow life spaces (1958:

109)."

It may be observed through ordinary, every-day experience that one average room can easily induce at least two distinct reactions from even the same person. The combination of silence, restricted movement, and isolation may accentuate claustrophobia; whereas, with the proper atmosphere present, the same room of "four protecting walls is often as reassuring to our ego" as the floor is to our equilibrium. "One of modern architecture's great victories has been to prove, in its own field at least, that freedom and security are not incompatible (Space, 1948: 159)."

Two examples of Hall's "semifixed-feature" spaces are the sociopetal and the sociofugal, terms used by many architectural critics as well. Sociofugal spaces, like railway waiting rooms, tend to eliminate involvement and are easier to maintain; sociopetal spaces foster social involvement by drawing people towards a common center (1966: 103).

Observations made by psychologist, Robert Sommer, at a Saskatchewan health and research center dealt with encouraging the sociopetal. The most particularly interesting finding was that given a conducive environment of proper space, cheerful color, and adequate light, a sociopetal situation may easily result. The conversational patterns showed that conversations between two people sitting at right angles were twice as frequent as those who sat side by side, which in turn were three times as frequent as those between people

facing each other (Hall, 1966: 102). It may be assumed from this observation that since a minimal effort is needed to turn one's head forty-five degrees and one is free to look straight ahead without appearing rude--still able to see the other person in the peripheral vision--an amount of variety must induce a certain amount of social ease.

People who would sit side by side--as on a sofa--must either turn their entire bodies or their necks sharply ninety degrees to see the person with whom they are talking. Whereas, people will stand facing each other and talk at a party or on a street, it seems to be a general desire to have at least a low table between them if they are seated facing one another. Because a definite amount of space is needed to accommodate two pair of feet and the smallest table, the greatest conversational distance between these two people becomes the least stimulating in regard to social involvement. It would seem, then, that the sociopetal arrangement of the crossed-corner is six times as conducive as the face-to-face due to the proximity afforded, while offering slight periodic disinvolvement.

It should be remembered, however, that exceptions of relationship and culture will vary in a semifixed-feature space such as furniture arrangement. Neither is sociopetal space predominantly good nor sociofugal universally bad. What is desirable is flexibility in order that occasion and mood allow involvement in a variety of spaces (Hall,

1966: 103).

The effect of man's feelings and emotions--often dismissed as trivial--is immense in observance of his actions. An environment opaque to man's feelings is as unsatisfying as an environment resisting practical and functional control. His systems built from his feelings, man needs to discover harmonies between his senses, his behavior, his extensions, and his surroundings. Detachment from emotional life only results in a breakdown of his development (Giedion, 1959: 427).

To the artist, Giedion assigned the responsibility of opening up the new realms of feeling. Without the arts of the past, the world would lack all emotional significance, but there must be new solutions for the "great areas of our experience . . . still waiting to be claimed by feeling." No longer bound to the earth, the birds-eye view has made us aware of totally new aspects of the world (1959: 428).

Man looks to the designer for a sign and a promise of comfort in his civilization. Involved in a current spiritual movement whose aim is human, man seeks a solution to the problems of spatial freedom and cultural integration, and he launches an appeal for harmony in physical environment (Zevi, 1957: 158). Heretofore, Mr. Round Peg and his activities have been compressed and arranged in sturdy, foursquare buildings that stand in formation along Square Hole Drive. Today the designer can work the other way around. By

analyzing man's emotional and material needs, the designer can create shells that embrace the human need pattern (Space, 1948: 155).

Primarily, design must no longer be directed either towards the esthetic or intellectual, the cultural or the emotional. It must speak as an integral unit to the integrated human being, who must participate equally. He must acquire a sixth sense of "feeling for space," "love of space," and "freedom in space"; for it is in living and positive space that life and culture, spiritual interest and social responsibility are bound. Space is in every sense, "especially in a human and integrated sense, a reality in which we live (Zevi, 1957: 242)."

SUMMARY

In all architectural design the first problem to consider is the space to be enclosed, and in the enclosure of space, the most important consideration is man and his activities. Man's importance as the criterion by which all buildings must be judged cannot be over-emphasized. In any building in which man is to function properly, his form and activities are the measure by which the shape of the building must be designed. For centuries, the right angle has dominated the spatial structure with little thought given to the fact that there is not one right angle in the human body, nor does anyone by nature walk and shift mechanically at ninety degree turns. Only the military mind--appreciative more of robots than individuals--finds the precision of foursquare paths the least bit normal.

To design properly for man the designer must respect the human form, its actions and reactions, and he must know man's capabilities as well as his constrictions in movement. The designer must know the extent to which man can comfortably reach as well as how much room he needs to keep from feeling cramped. Just preventing <u>being</u> cramped is no longer a valid solution. How man <u>feels</u> in a given space is what must be considered and, since all perceptions are unique with the individual, a single given space will evoke as many

separate responses as there are individuals who experience that space. The designer must then remember that a communal solution must be the answer for all spaces--with the possible exception of those inhabited by hermits.

By first observing and studying the human form, the designer will be equipped more adequately to create proper spaces. He must know the mechanism of the neuro-muscular system and how it performs with regard to the function for which the space is being designed. The designer must be aware of the sensory co-operation that informs man in his perception of spaces, near and distant, thus enabling him to move about in an orderly manner. Visual spatial cues may be clear, and they may be obscure--neither clarity nor obscurity being always good and bad, respectively. Illusions are frequently necessary to add breadth or height to a space and sometimes they may simply add interest where clarity would be drab. Gibson's thirteen shifts, for example, may be consulted and by quickening a recession--as is often employed in theatrical design--a greater distance would be perceived; by slowing down the recession a large space might be made more intimate. What should be considered is the desired effect on the observer and how he will visually perceive and react as a result of the spatial design.

Auditory space perception must be respected in regard to an environment's purpose. Rooms that require concentration and thought may be utilized by a large group of people

if the design is handled properly. The general reading room of the New York Public Library would be a good example of this rule. What must be accredited for the room's success is the vast height of the ceiling; for, if the same amount of floor space were available with only a twelve foot ceiling--itself quite luxurious in a private home--it is conceivable the reverberations from whispers and even breathing would make the place intolerable. The same twelve foot ceiling on the main level of Grand Central Station with all its commotion would create pure bedlam. Men, as well as man, become the criterion in public spaces.

Texture may be used as a visual cue to distance, but it is equally important as a tactile stimulus. Marble, velvet, rich woods, and molded metals are inviting to the touch and should be used to attract the hand as rich colors and pleasant proportions attract the eye. Coarse granite, spiked sculptures, and other uninviting effects may be used just as accurately in spaces which are purposely designed for asocial activities.

While man's sensory perceptions and kinesthetic reactions are the beginning considerations in spatial design, they are only the beginnings. Man's extensions in his intraspecies distances should be the determining factors in spatial dimensions, not his vital statistics as listed on his driver's license.

Instinctively a social being, man has naturally lived

among men since the dawn of civilization. Like the other vertebrates, he has claimed a portion of the land for himself, but the boundaries of his territory have always coincided with those of another. Through experience and inherited ideals, all men are at least subconsciously aware of the amount of living space they and their families need. The problem today is to make them consciously aware of their spatial needs and possibly direct their unrest toward solving the space problem instead of destroying the social structure.

The designer must always be aware of the fact that one man's spatial needs are similar if not identical to another and in most cases the territories of each are adjoining. As such, they must be harmoniously akin for the betterment of the society, as the separate spaces must be harmonious with the life of the individual.

By the simultaneous use of the physiological, psychological, and esthetic factors of architecture, the designer should create environments that are as reflective of man's feelings as they are of his activities. Spaces should be enclosed that allow man to expand in spirit as easily as they allow the extension of his physical being. Such spaces are designed only when they are unified in form and character as man is unified in body and soul.

That man has soul as well as body is a most universal belief and, as such, his soul must be given as much room if

not more than his body. It is this conception of the immeasurable soul that demands a feeling for space rather than its simple linear measurement.

If only the body and its constraints are to be considered, man is regarded as little more than an automaton. But man has feelings. He hopes and dreams; he is depressed and inflated by his everyday encounters with other men as well as his own environment. His feelings must be given room to expand and to develop, and they are as priceless as Love, Justice and Fair Play.

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